cases were recruited in our study. **RESULTS:** The majority of the eligible Medicare beneficiaries responded "not at all likely" to take Part D (62%), and significant proportions also reported "not too likely" to take Part D (21.46%), while few of them reported "somewhat likely"(9.44%) and "Very likely"(6.31%). Results of weighted cumulative logit regression indicated that people who had cost barriers in medication use were significantly more likely to take up Medicare Part D (OR=2.62, 95% CI[2.00, 3.44], p<0.001). Males and older adults were less likely to take up Medicare Part D (OR=0.83, 95% CI[0.74, 0.94] and OR=0.98, 95% CI[0.97, 1.00], p<0.01). **CONCLUSIONS:** Results of this study indicated experiencing CRD was significantly associated with the probability of taking up Part D. CRN could be a motivation of taking up Part D. Thus, characteristics of beneficiaries who reported having CRN, especially those who continued to experience CRN after taking up Part D, need further studies.

MA4

COMPREHENSIVE ASSESSMENT OF PATIENT ADHERENCE TO DRUG THERAPY: AN EXAMPLE UTILIZING REAL WORLD DATA FOR AN ORAL MULTIPLE SCLEROSIS TREATMENT

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OBJECTIVES: Medication possession ratio (MPR) and persistence are typically used as measures of patients' drug use patterns. However, these measures may not capture all aspects related to real world dosing. We aim to explore additional approaches to enhance meaningful interpretation of patients' drug use patterns using persistence, adherence and average daily dose (ADD) data of dimethyl fumarate (DF) in a real world dataset. **METHODS:** A retrospective cohort study using the MarketScan Commercial and Medicare Databases (March 2013 – January 2014) was conducted in adult multiple sclerosis patients. Patients with DF claims who were continuously enrolled for at least 9 months before and after starting therapy were included (n=2,879). Outcomes included time to treatment non-persistence (switch to another disease modifying therapy (DMT) or drug discontinuation of ≥ 30 days), adherence (MPR and percent of days covered (PDC)), and estimated ADD. Data were interpreted in the context of the FDA approved daily dosing (240 mg b.i.d.), and an earlier trial (1) reporting dose-related MRI findings indicating non-significant effects on brain lesions for 360 mg/day and 120 mg/day doses. **RESULTS:** The mean (SD) DF treatment duration was 96 (66) days (median 83) and 24% of patients became non-persistent. Mean (SD) MPR and PDC were 0.83 (0.26) and 0.75 (0.29), respectively. ADD (SD) was 417 mg/day (221) with 15.3% treated at < 240 mg/day, 5.6% at 240-359 mg/day, 47.8% at 360-479 mg/day, and 31.3% at ≥ 480 mg/day (i.e., 20.9% treated at <360 mg/day and 68.7% treated at less than the labeled dose). **CONCLUSIONS:** The finding of a large proportion of patients receiving potentially sub-optimal treatment, as determined by ADD on DF, indicates significant potential clinical consequences for these patients. The approach used in this study could be used in other similar studies examining treatment adherence to enhance meaningful interpretation of adherence data. 1. Lancet 2008; 372(9618):1463-72.

MEDICAL DEVICE & DIAGNOSTIC RESEARCH STUDIES

MD1

ECONOMIC EVALUATION OF BST-CARGEL AS AN ADJUNCT TO MICROFRACTURE VERSUS MICROFRACTURE ALONE IN KNEE CARTILAGE SURGERY

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OBJECTIVES: Knee cartilage damage is a common cause of referral for orthopaedic surgery. Treatment aims to reduce pain and symptoms by repairing cartilage. Microfracture, the current standard of care, yields good short-term clinical outcomes; however, treatment might fail after 2-3 years. A Chitosan-Beta glycerolphosphate bioscaffold is used as an adjunct to microfracture and demonstrates improvements in quantity and quality of repaired tissue, potentially reducing the risk of treatment failure. This study aimed to establish the economic value of bioscaffold versus microfracture alone in knee cartilage repair from the societal perspective, using Germany as the reference market. **METHODS:** A decision tree with a 20-year time-horizon was constructed, in which undesirable clinical events were inferred following initial surgery. These events consisted of pain management, surgery and total knee replacement. Clinical outcomes were taken from the pivotal clinical trial, supplemented by other literature. Data and assumptions were validated by an internationally recognized Delphi panel. All relevant resource use and costs for procedures and events were considered. **RESULTS:** In a group of patients with all lesion sizes, the model inferred that bioscaffold yields a positive return on investment at year 4 (with 20-year cumulative cost savings of €6,448). Reducing the incremental risk of treatment failure gap between bioscaffold and microfracture by 25% to 50% does not alter this conclusion. Cost savings are greatest for patients with large lesions; Results for patients with small lesions are more modest. **CONCLUSIONS:** The Chitosan-Beta glycerolphosphate bioscaffold potentially represents a cost-saving alternative for patients with knee cartilage injury by reducing the risk of clinical events through regeneration of chondral tissue with hyaline characteristics. Since the burden of this condition is high, both to the patient and society, an effective and economically viable alternative is of importance.

MD2

COVERAGE LIMITS ON BLOOD GLUCOSE TEST STRIP REIMBURSEMENT FOR DIABETICS IN CANADA: UTILIZATION IMPACT FOR DIABETIC PATIENTS IN THE ONTARIO PUBLIC DRUG PROGRAM (OPDP)

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OBJECTIVES: In August 2013 the Ontario government implemented annual limits on the number of blood glucose test strips (BGTS) it will reimburse for people with diabetes. The change is based on research that shows BGTS have a limited clinical benefit for diabetes patients who do not require insulin. Under the Ontario Public Drug Programs (OPDP), these patients have a 200-400 strip/year limit, whereas patients who require insulin can receive up to 3,000 strips annually. The policy intent was not to change BGTS utilization for insulin patients; however, concerns exist around potential negative impacts on diabetes management. The objective of this analysis is to quantify the impact of this new BGTS utilization policy in Ontario across diabetes patients based on their diabetes treatment. **METHODS:** All patients who received BGTS coverage from the OPDP during July 2012 – September 2014 were selected for analysis using the IMS Brogan OPDP Database. Annual BGTS utilization prior to the policy change (July 2012 – June 2013) was then compared to annual BGTS utilization following Ontario's coverage limit (October 2013 - September 2014). Patients were categorized into one of four cohorts based on their diabetes medication history: 'insulin only',' insulin + oral anti-diabetic (OAD)', 'OAD', or 'neither'. Changes in utilization patterns were assessed for each cohort. **RESULTS:** 422,525 patients were identified for the pre-period, and 422,154 patients were identified for the post-period. Overall BGTS unit volume declined from 192M to 147M (-24%) following the OPDP policy change. On average, the number of BGTS per patient per year decreased for 'OAD ' and 'neither' cohorts by 42% and 54%, respectively. Impact to patients managing diabetes with insulin was minimal: 'insulin only' (-1%) and 'insulin + OAD' (-2%). **CONCLUSIONS:** BGTS utilization markedly decreased in diabetes patients not managed with insulin; test strip utilization was marginally impacted for patients using insulin.

MD3

ECONOMIC IMPACT OF CHANGES IN NICU VENTILATION STRATEGIES WITH THE ADVENT OF NEW NONINVASIVE VENTILATION TECHNIQUES: A REVIEW AND PROPOSED ASSESSMENT FRAMEWORK FOR HIGH FLOW THERAPY (HFT) AS A ROUTINE RESPIRATORY SUPPORT PARADIGM

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OBJECTIVES: High flow therapy (HFT) has been demonstrated to be a safe and effective noninvasive respiratory support technique for the treatment of pre-term infants in neonatal intensive care units (NICU). Our objective was to develop a quantitative framework based on available evidence to estimate the economic impact of adoption of a HFT respiratory support strategy compared to current standard of care. **METHODS:** We constructed a model to estimate total cost per NICU episode of care by treatment strategy, considering utilization and duration of the different types of ventilatory support modalities – conventional mechanical ventilation (CMV), nasal continuous positive airway pressure (nCPAP) ventilation, and HFT – as well as utilization levels of surfactant, chest x-rays, blood gas analyses and total NICU length of stay. Model parameters were derived from a recent study comparing respiratory modality utilization between five US-based neonatal intensive care units (NICUs) adopting a HFT strategy and a larger pool of NICUs in the Vermont-Oxford Network (VON), and from single center experience. We computed the total cost difference between the respiratory support strategies based on published cost data. Parameter uncertainty was tested in sensitivity analyses. **RESULTS:** The base case analysis resulted in total average length of ventilation of 25.48 days for the non-HFT strategy (8.92 days nCPAP, 6.10 days HFT, 10.47 days CMV) and of 25.06 days (2.88 days nCPAP, 16.86 days HFT, 5.32 days CMV) for the HFT strategy. HFT was associated with total projected cost savings of $2,317. Results were sensitive to length of HFT use, length of CMV, cost of HFT, and length of nCPAP support. **CONCLUSIONS:** Adoption of a HFT strategy appears to be associated with meaningful savings in total NICU episode of care costs, primarily resulting from reductions in the time of conventional mechanical ventilation. Further research is warranted to substantiate these findings.

MD4

ECONOMIC VALUE OF IMPROVED ACCURACY FOR SELF-MONITORING OF BLOOD GLUCOSE DEVICES FOR TYPE 1 DIABETES

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OBJECTIVES: To simulate and compare clinical and economic outcomes of self-monitoring of blood glucose (SMBG) devices along accuracy ranges and strip price. **METHODS:** We programmed a long-term type 1 diabetes natural history and treatment cost-effectiveness model. In phase one, using In Silico modeling validated by the Food and Drug Administration, we associated changes in accuracy error rates of SMBG devices to changes in HbA1c (holding hypoglycemic rates unchanged) and changes in severe hypoglycemia rates requiring an inpatient stay (holding HbA1c levels unchanged). In phase two, using Markov cohort simulation modeling, we estimated lifetime clinical and economic outcomes from the Canadian payer perspective. The primary comparison was a SMBG device with strip price $0.73 Canadian dollars (CAD) with accuracy error rate of 10% versus a SMBG device with strip price $0.60 CAD with accuracy error rate of 15%. Outcomes for the average patient, discounted at 3% per annum, were quality-adjusted life years (QALYs), costs, incremental cost-effectiveness ratios (ICERs), and budget impact. **RESULTS:** Assuming the benefits translate into HbA1c improvements only, the ICER with accuracy error rate of 10% versus 15% was $11,500 CAD per QALY. Assuming the benefits translate into reduced severe hypoglycemic events that required an inpatient stay only, an SMBG device with accuracy error rate of 10% dominates (i.e., less costly, more effective) an SMBG device with accuracy error rate of 15%. Assuming SMBG errors only impact HbA1c improvements, and when varying all inputs simultaneously through a probabilistic sensitivity analysis, 91% of simulations were cost-effective at a willingness-to-pay of $100,000 per QALY. The five-year budget impact findings ranged from $0.0005 per member per month for HbA1c improvements to cost-savings for severe hypoglycemic event reductions. **CONCLUSIONS:** From the efficiency (cost-effectiveness) and affordability (budget impact) payer perspectives, reducing the error in SMBG devices appears to be an efficient and affordable strategy.

RESEARCH ON MODELING METHODS STUDIES

MO1
REDUCING AND QUANTIFYING OVER-FITTING IN REGRESSION MODELS

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OBJECTIVES: Regression models are the multivariable analytical method of choice for epidemiologists and statisticians. It is widely recognized that these models may suffer from over-fitting, where the sample estimates fail to generalize to other samples. Systematic approaches to minimize over-fitting are seldom adopted and there is a reluctance to hold data back for independent assessment of model performance. This study assesses penalized regressions for reducing over-fitting, cross-validation on training data for estimating over-fitting, and the extent to which over-fitting produces misleading conclusions. **METHODS:** Data were extracted from the IMS PharMetrics Plus US medical claims database for patients with Multiple Sclerosis receiving one of two treatments. Cohorts were matched using propensity scoring, producing 3,348 matched pairs. The probability of relapse and persistence were estimated using standard, stepwise and (LASSO) penalized logistic regressions. Over-fitting was measured as the difference between the Area Under Curve (AUC) for training and test data and additionally estimated using cross-validation on training data alone. **RESULTS:** Penalized logistic regressions greatly reduced over-fitting compared to standard and stepwise alternatives, irrespective of the choice of response variable and degrees of freedom: for example, modelling relapse with 50% of the data used for training and 50% used for testing showed overfitting of 9.9% with standard, 8.0% with stepwise and 3.9% with penalized logistic regression. Cross-validation provided reasonable approximations for over-fitting; estimated over-fitting for the above standard logistic model was 10.4%. Over-fitting inflated the estimated treatment effect by 25% (OR=2.03 vs. 1.64; standard logistic model vs. penalized model). **CONCLUSIONS:** Penalized logistic regression models had substantially lower over-fitting. Moreover, good estimates of over-fitting can be derived without withholding data. Both penalized regressions and cross-validation are straightforward to implement in most statistical packages and greater adoption of these methods is encouraged to ensure more reliable estimates of risk factors.

MO2
A COMPARISON OF STATE TRANSITION AND DISCRETE EVENT MODELING APPROACHES FOR ANTIPLATELET USE IN THE SECONDARY PREVENTION OF THROMBOTIC EVENTS AFTER MYOCARDIAL INFARCTION (MI)

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OBJECTIVES: A state transition model (STM) and a discrete event simulation (DES) were developed to evaluate the health outcomes associated with antiplatelet treatments for secondary prevention of thrombotic events for patients with a recent myocardial infarction (MI) in the UK. **METHODS:** The STM and DES were developed with similar assumptions about which events altered risk. In both models, results were compared between the vorapaxar plus standard care (VOR) and the standard care (SC) arms. Individual patient characteristics at baseline from the qualifying MI cohort of TRA 2°P-TIMI 50 trial were used to define patient profiles in both models; risk equations developed from the trial were used to estimate MI, stroke, and cardiovascular-related death risk. Bleeding event risks, case fatality rates, non-cardiovascular mortality, and utilities were taken from published studies or UK statistics. **RESULTS:** In the base case, for the VOR and SC arms, the DES predicted 13.93 and 13.70 quality-adjusted life years (QALYs), respectively, versus 12.27 and 11.81 in the STM. The DES predicted 0.268 MIs, 0.140 strokes, and 0.318 CV-deaths per patient in the VOR arm, and 0.279 MIs, 0.145 strokes, and 0.325 CV-deaths per patient in the SC arm. The STM predicted 0.226 MIs, 0.132 strokes, and 0.417 CV-deaths per patient in the VOR arm, and 0.234 MIs, 0.136 strokes, and 0.435 CV-deaths per patient in the SC arm. **CONCLUSIONS:** Although these two models have very different structures, both estimated similar outcomes. The DES predicted more MI and stroke events than the STM, as patients can have multiple events in a short time frame rather than one event per model cycle. While both approaches are valid, the DES technique offers greater flexibility through its ability to consider many risk-changing events without "exploding" health states and to track changes in risk factors more efficiently.

MO3
DOES THE USE OF EFFICACY OR EFFECTIVENESS EVIDENCE IN COST-EFFECTIVENESS ANALYSES MATTER?

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OBJECTIVES: Clinical efficacy or effectiveness (the "E") is one driver of cost-effectiveness analysis (CEAs). The type of "E" used in each CEA depend on the objectives and corresponding data sources. Applying different types of the "E" might affect CEA conclusions, but little is known. We aim to test the association of type of "E" and cost-effectiveness conclusions using asthma CEAs as an example. **METHODS:** A systematic review was performed with 5 electronic databases from 2009 to 2014. All CEA studies evaluating asthma medication(s) and reporting incremental cost per quality-adjusted life year (QALY) were included. The "E" which was derived from an explanatory randomized controlled trial(s) (RCT) or meta-analysis of RCTs was defined as efficacy, while the "E" from a pragmatic RCT(s), an observational study, or registry was classified as effectiveness. Three times the World Health Organization Gross Domestic Product was used to determine a cost-effectiveness willingness-to-pay threshold per QALY gained. Logistic regression was used to associate type of "E" and cost-effectiveness conclusions. **RESULTS:** A total of 17 CEAs were included. Nine studies (52.9%) used efficacy evidence, while 8 studies (47.1%) used effectiveness evidence. Ten studies (58.8%) were modeling-based studies, while 7 studies (41.2%) were CEA-alongside-clinical trials. The "E" of 5 studies (29.4%) were derived from explanatory RCTs, 4 studies (23.5%) from meta-analysis of RCTs, 4 studies (23.5%) from pragmatic trials, and another 4 studies (23.5%) from observational studies. The odds ratio for effectiveness versus efficacy being cost-effective was 8.75 (95% confidence interval; 0.74 to 103.82). **CONCLUSIONS:** Most CEA studies in asthma used efficacy data to inform CEA. Studies using effectiveness data trend toward being more likely to disseminate cost-effective findings than those using efficacy data. Health policy decision makers should pay attention to the type of "E" evidence used in CEAs for accurate interpretation and application.

MO4
EXTRAPOLATING ALL-CAUSE MORTALITY ESTIMATES IN ECONOMIC EVALUATIONS: A SIMULATION ANALYSIS

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OBJECTIVES: A cost-effectiveness model can be populated using mortality rates from a period's life-table or using extrapolations of mortality based on historical life-tables. Current decision models use the first method. This simulation study aims at identifying the impact of mortality methods used on cost effectiveness analyses. **METHODS:** A simulation study was designed based on a two-state Markov model (alive-death) that compared a hypothetical intervention against no intervention. The model was populated with age-specific, all-cause mortality probabilities from the estimation methods presented above. The mortality extrapolations were estimated using a smoothed Lee-Carter method. The model outcomes were incremental costs, life-years gained (LYG) and incremental net benefit (INB). The proportional difference (PD) of the model outcomes between the two mortality estimation methods was the outcome of each simulation. The following parameters were simultaneously varied: discounting rate (0- 0.05), intervention effect (relative risk of mortality: 0.9-0.99), age at intervention (birth- 80 years old), duration of intervention effect (1 year/10 years/ lifelong), duration of intervention administration. Simulations were conducted using Canadian life-tables. The impact of each parameter on the simulation outcomes was estimated using descriptive and graphical methods. **RESULTS:** The cohorts' age and the discount level had an important effect on the PD in all outcomes (LYG, incremental cost and NHB) The duration of intervention effect and administration were more influential on the effect of method on the PD of incremental costs and INB. Large variation was observed among the scenarios within parameter values, for the PD of all outcomes. **CONCLUSIONS:** When using mortality projection methods, substantial differences were observed in CEA model outcomes. Given that the magnitude and the direction of the impact of mortality estimation methods on the model outcomes is multifactorial, decisions on the mortality estimation method used in economic evaluations should be considered after conducting sensitivity analyses using both methods.

RESEARCH PODIUM PRESENTATIONS - SESSION II

CANCER OUTCOMES RESEARCH STUDIES

CN1
THE IMPACT OF CHRONIC CONDITIONS ON THE ECONOMIC BURDEN OF CANCER SURVIVORSHIP IN THE UNITED STATES

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OBJECTIVES: The objective of this study is to examine the prevalence of chronic conditions and their impact on the economic burden among cancer survivors in the United States. **METHODS:** Using the 2008-2012 Medical Expenditure Panel Survey (MEPS) we identified 8,617 cancer survivors and 111,695 individuals without a history of cancer. Adjusted predictive margins from multivariable regression were used to examine the prevalence of chronic conditions. Direct medical costs were measured using annual health care expenditures and adjusted means were estimated using a two-part model. Indirect morbidity costs were calculated from the lost productivity due to employment disability, missed work days, and lost household productivity and adjusted means were estimated using multivariable logistic regression and negative binomial regression modelling. Separate models were used to evaluate the impact of each chronic condition and the impact of MCCs. **RESULTS:** Cancer survivors were more likely to have MCCs, with 12.4% reporting ≥4 chronic conditions compared to 9.3% of individuals without a history of cancer. Medical expenditures for cancer survivors with other chronic conditions, particularly those with MCCs were higher than among cancer survivors without any of the chronic conditions studied. The largest increase in medical expenditures was associated with heart disease ($4,287) and stroke ($4,210). Having ≥4 chronic conditions was associated with increased expenditures of $9,082 per cancer survivor. Lost productivity was greater among cancer survivors with other chronic conditions. The largest increase in lost productivity was associated with stroke ($4,144) and arthritis ($3,426). Having ≥4 chronic conditions was associated with increased lost productivity of $9,245 per cancer survivor. **CONCLUSIONS:** Chronic conditions, especially the presence of MCCs, are associated with higher medical expenditures and lost productivity among cancer survivors. Efforts to reduce the health and economic burden caused by chronic conditions among cancer survivors are important given their substantial impact on medical expenditures and lost productivity.

CN2
A COMPARATIVE COST UTILITY ANALYSIS FOR FIRST LINE TREATMENT OF METASTATIC NON-SMALL CELL LUNG CANCER (NSCLC) PATIENTS WITH EGFR EXON 19 DELETIONS OR EXON 21 (L858R) SUBSTITUTION MUTATIONS

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